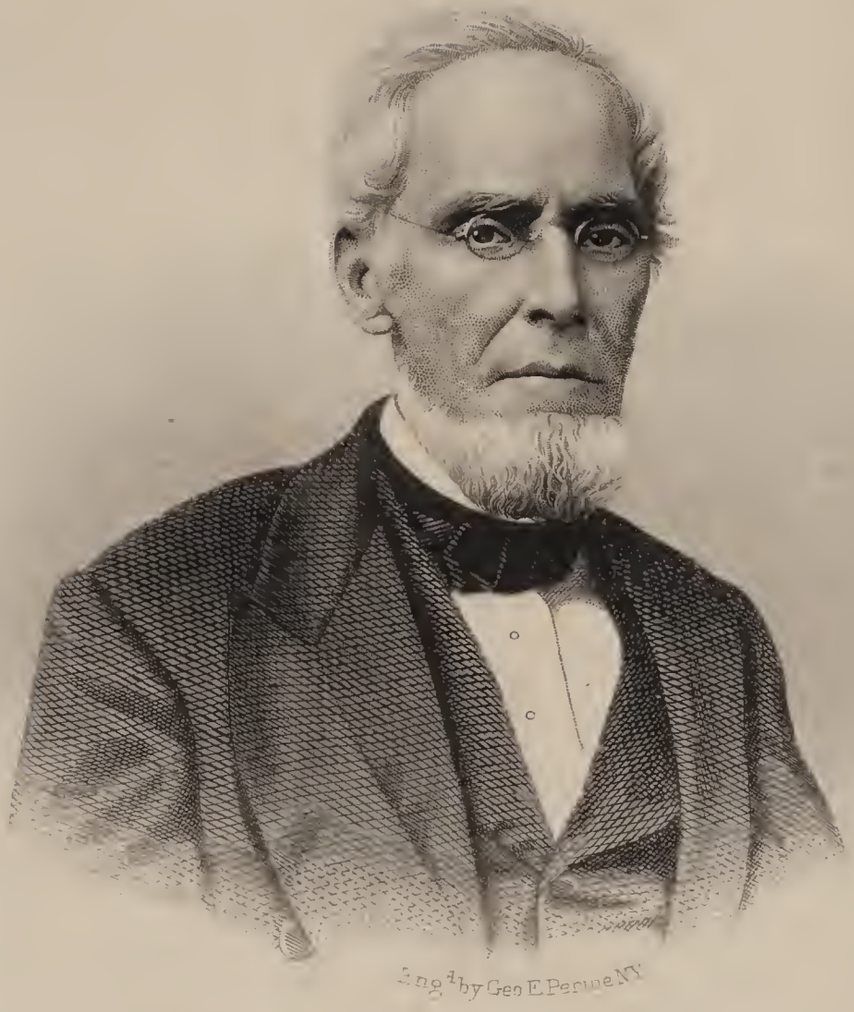
Gail Borden.



Engd by Geo E Perine NY

Gail Borden

A

BRIEF SKETCH

OF

GAIL BORDEN,

AND HIS RELATIONS TO

SOME FORMS OF CONCENTRATED FOOD.

BY

S. L. GOODALE,

Secretary Maine Board of Agriculture.

PORTLAND, ME.:

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1872.

HAVING enjoyed intimate acquaintance with the subject of this sketch, and being familiar with his unwearied labors, continued struggles, and alternate disappointments and successes, the writer has been led to pen what follows, partly in the hope that others might be encouraged to perseverance in well doing under difficulties, and partly, noting occasional denial of the credit believed to be due to him as an original discoverer, to supply some facts which may contribute to a just estimate.

SACO, May, 1872.

Gail Borden, widely known in connection with various forms of concentrated food, has a checkered and interesting history.

He was born 1801, of New England parents, in the town of Norwich, New York, the eldest of seven children. At an early age he assisted his father upon his farm, and profited, so far as practicable, by the limited educational privileges within his reach.

In December, 1814, his father removed to Cincinnati, at or near which place he remained during the year following. At that time the site of Covington, Ky., opposite Cincinnati, was occupied as farm lands, and upon it were only two houses and a barn. With the aid of his brothers, Gail cultivated a field of corn where the City Hall now stands.

In the spring of 1816 the family settled in the territory of Indiana, upon the banks of the Ohio, ten miles below Madison, where Gail lived until twenty-one years of age. His health, meantime, becoming seriously impaired so that his physicians despaired of his recovery, he determined to try a southern cli-

mate. In pursuance of this plan he went as supercargo of a flat-boat to New Orleans, and having disposed of the cargo he went into a piney woods district of Mississippi, and at first engaged in teaching. In this healthful region, with care and abstemious living, his health was restored. Here he was appointed County Surveyor, and also Deputy United States Surveyor. Having married, he removed to Texas in 1829, his father and father-in-law with their families, preceding him thither.

His first employment was farming and stock growing. He was elected a delegate from La Vaca district to the convention held in 1833, at San Felipe, to define the position of the colonies, and to petition the Mexican government for separation from the State of Coahuila.

Appointed by Gen. Austin to superintend the official surveys, he compiled the first topographical map of the colonies, and up to the time of the Mexican invasion had charge of the Land Office at San Felipe, under direction of Samuel M. Williams, then Colonial Secretary.

As the war came on which led to a separation from Mexico, Mr. Borden, with two others, procured a press and printing materials, and published the only news-

paper issued in Texas during the war. He had its chief management, and directed his efforts towards resisting the establishment of the Central government by Santa Anna.

The Republic of Texas being at length founded and revenue departments established, Mr. Borden was appointed by President Houston first Collector of the port of Galveston; which city, up to 1837, had not been laid out. Mr. Borden made the first surveys of the city, prior to taking charge of the customs, in June of that year. His first dwelling there was a rough board structure, on the bay shore, erected by two carpenters in half a day. His office was in a room in what was known as the Mexican custom-house, which was occupied in part as a dwelling by the military commandant of the post (Col. Turner) with his family.

In 1839 he was appointed agent of the Galveston City Company, a corporation holding several thousand acres on which the city is built. This position he held for over twelve years. Towards the close of this period his attention was drawn to the urgent need of more suitable food supplies for the emigrants and travelers across the plains, the want of which involved great suffering, and even loss of life.

His experimental labors with this end in view, resulted in the production of a "meat biscuit," to which reference will again be made. Its merits were soon so fully recognized, that he felt warranted in embarking all his means in its extensive manufacture, and he did so. Just as success seemed almost assured, he was thrown into serious embarrassments through the artful plottings of parties interested in the very profitable furnishing of the ordinary bulky supplies for the army, and who deemed their craft imperiled by the threatened substitution of a new food, at once cheap, portable and nutritious beyond comparison. From the unequal contest thus commenced, Mr. Borden emerged penniless, and with his native endowments only in possession, began anew the battle of life.

Going North directly upon the issue of his late enterprise, which, however disastrous it may appear from the stand-point most frequently occupied, was nevertheless a decided success from another point of view, what could be more natural than that his thoughts should turn to the preservation of *milk?* Milk is universally conceded to be the most perfect single article of food to be found in the whole realm of nature,—the only natural product perfectly fitted

to sustain life. In the best possible proportions pure milk combines all those flesh-forming, heat-supporting, force-yielding constituents needful to healthy growth and the development of a perfect physique; yet no other food is so perishable in its nature, nor was any other so difficult of access in large cities in normal purity and freshness. Shameless dilution or adulteration so frequently attended the article sold, that a strictly honest milkman is even now deemed a mythical personage by many citizens, rather than one having a *bona fide* existence in their midst. Numberless thousands of infants in the great cities of the world have undoubtedly perished who might have been reared had milk been supplied in its freshness and pristine goodness. To the adult dweller in cities, to the soldier in camp, and to the sailor upon the ocean, what a boon would its furnishing be! Mr. Borden promptly recognized the obvious and urgent need, and determined to supply it,—if he could.

Nor can it be thought strange that, in casting about for methods by which to solve the problem, he should seek to turn to account some of the lessons taught him by the results of his various tentative manipulations in connection with the meat biscuit. Foremost among the lessons then learned was that to resist the

beginnings of evil is sometimes as useful in conducting physical processes as in directing moral actions. Although he knew nothing of the "germ theory," and little of other hypotheses, he had come to have a wholesome dread of incipient decomposition, and rightly judged that if he could prevent its beginning, its progress would make small inroads upon his products.

The object at which he aimed took a sharply defined form at the very outset, namely, to accomplish the preservation of milk by the simple removal of water, accompanied by security against the occurrence of possible detriment from the time when the milk was drawn from the cow until the process was completed. He was aware that numerous attempts had been made to preserve and to solidify milk, as well as to find acceptable substitutes for it, and he knew, also, or believed, that all had proved failures, greater or less; certainly he found no products which made a near approach to such excellence as he believed to be attainable.

Scientific friends, one of whom ranked as the peer of any in the land, advised him that his aim, in one respect, was too high,—that the retention of all the butter, uninjured, in connection with the other solid

constituents of milk, would be found unattainable in practice, and that the removal of a part of the cream would be found a necessary preliminary step; but he utterly discarded the thought of condensing "skim" milk, and pushed on regardless of the advice, persevering with indomitable will and energy until his object was fully attained.

Recognition of its merits, and reception by the public, came, however, by halting and toilsome steps, until 1861, when the civil war made it quickly and extensively known, so that the demand rapidly increased until it exceeded the supply.

Pecuniary, as well as manufacturing success, in due time crowned his labors; and uncounted thousands of soldiers, in camp and in hospital,—of citizens, both well and ill,—of city-born infants, pining for pure milk fit for babes, hold its inventor and manufacturer in grateful remembrance and esteem; and if we attempt to estimate the value of his achievement, taking into account the increasing number of children annually born in our large cities (which are growing faster than the rural districts), and the larger proportion of them who will, in consequence of his discovery, grow up to manhood and womanhood, healthy and strong by reason of a supply of pure milk in

place of the dilute and adulterate trash, or the vile secretion of diseased cows fed upon distillery slops, so often sold for "pure country milk;" and these children in their turn to become fathers and mothers of our race, the benefits conferred by it enlarge immeasurably.

Since Mr. Borden's claim to be the original discoverer of the only process for condensing milk which has received universal approval and exclusive adoption, both in this country and in Europe has been doubted by some and denied by others, it may be well to introduce enough of the facts pertaining to its history to place the matter at rest.*

After testing various methods, and carefully observing their several results, Mr. Borden became convinced that protection from injurious atmospheric influences during the process of evaporation was an essential requisite to the highest degree of success.

But he found that serious difficulties were at once encountered in the attempt to carry this method into practical operation; a very troublesome one being adhesion of the albuminous constituent of the milk

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* For such a denial, and its easy refutation by a simple comparison of dates, see Appendix A.

to the inner surface of the vacuum pan; besides which, the foaming of the milk under the lessened pressure (involving liability to sudden loss by boiling over) was such that an experienced sugar boiler, observing his attempts with hope to render assistance, pronounced the method utterly impracticable for the evaporation of milk, and his persistence in trying to employ it to be sheer folly. These and kindred difficulties, however, by dint of perseverance, aided by that fertility of resource so characteristic of the American pioneer, whether in the primeval forests or in the unexplored domain of art and science, were at length surmounted. He then felt warranted in proceeding to take the necessary steps to secure an ownership in the invention.

His first application for a patent was made in May, 1853. A principal feature of his process was declared to be evaporation *in vacuo*. The importance of protecting the milk from atmospheric action in order to prevent incipient decomposition was emphatically asserted in that first application, and has been held with tenacity ever since; his views with regard to its importance having undergone no change, either in theory or practice. This application was refused; various reasons being given for

the refusal, chiefly because it lacked the essential requisites of novelty and usefulness.

Prior to his application for a patent Mr. Borden had not the remotest idea that any one had anticipated him in conceiving of the use of the vacuum process for the concentration of milk, although he was aware of its use in the treatment of syrups in refining sugar, and in the preparation of extracts. For these purposes it was employed, because it enabled evaporation to proceed at a low temperature, thereby avoiding discoloration or burning. Borden's employment of it was for a wholly different purpose.*

But upon examination it appeared that one Grimwade had previously conceived the idea, and had planned an apparatus for carrying it into effect, which much resembled Mr. Borden's, and had ap-

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* In his application, Mr. Borden says:

"I am aware that sugar, and various extracts, have been and are now concentrated *in vacuo* under a low degree of heat, to prevent discoloration or burning. I do not claim concentrating milk in a vacuum pan for such a purpose; my object being to exclude the air from the beginning of the process to the end, to prevent incipient decomposition. This is important, and I claim the discovery."

The claim,—U. S. Patent, Aug., 1856,—is in the following words:

"Producing concentrated sweet milk by evaporation *in vacuo*, substantially as set forth,—the same having no sugar or other foreign matter mixed with it."

plied for a patent. It equally appeared, however, that the process was never practiced, and probably the conception was never embodied. Satisfactory evidence of this is found in the fact that he subsequently applied for and obtained a patent for a wholly different process, an integral part of which was evaporation in open pans, which method he practiced for some years. The vacuum process in Grimwade's mind probably never advanced beyond the abstract idea, accompanied with plans upon paper of apparatus for carrying it into operation. Either he did not attempt to carry it into execution, or finding himself unable to overcome the practical difficulties attending the process, he abandoned the attempt. He neither practiced it himself, nor did any one else under his patent. The conception fell still-born.

The examination following his application also showed, that, a dozen years before Grimwade's application, another had obtained a patent for a process of condensing milk by evaporation "in any known mode,"* mentioning, among others, blowing warm air through the milk, or by external warmth in connection with the vacuum pan; no preference being

* Could the applicant expect thus to cover and include in his patent all future improvements in methods of evaporation?

indicated for one mode over another; nor is there any intimation that exclusion of air during evaporation is desirable, but clearly the reverse. Diligent search by Mr. Borden's patent attorney in London, in 1853 (Mr. Barlow, of Chancery Lane), failed to discover the slightest indication that any one had ever worked a vacuum pan for evaporating milk under any patent. Thus the objection to granting a patent because the process lacked novelty was disposed of with comparative ease; but it proved a more difficult task to convince the Commissioner that it possessed such merit as to come within the designation of both "new and useful invention or discovery." In the second or third rejection, acting Commissioner Shugart says: "You allege great importance to working entirely in *vacuum*. This office does not have any faith in such an allegation." The opinion seemed firmly rooted in the minds of both the examiners and the Commissioner that the conceded superiority of the article shown by Mr. Borden as the product of his method was the result, not of any peculiar excellence in the process employed, but of greater care or superior skill in manipulation, and that like excellence could be reached with equal facility by any other method of evaporation.

Under a later date, Commissioner Mason wrote as follows: "Borden claims evaporation *in vacuo* to be the valuable feature of his discovery, and necessary. The Commissioner sees no reason to believe this." And again: "If it were really a discovery, Borden would be entitled to a patent, but I see nothing from which I can conclude that this exclusion of air is important. If it were shown to me that milk taken fresh from the cow and evaporated in the open air would not answer substantially the same purpose as when evaporated *in vacuo*, I would certainly grant to Mr. Borden the patent he asks; but until this is done, I do not feel justified in allowing it."

Upon the reception of this opinion Mr. Borden proceeded to obtain the necessary evidence, and presented it in the form of affidavits from several eminent scientific and practical men, including Mr. Macfarlane, of the Scientific American, and Mr. John H. Currie, of the Bellemont Laboratory, who, at Mr. Borden's instance, undertook an investigation of the merits of the case. After condensing milk by all the processes commonly in use, and carefully observing and comparing results, they became assured that the alleged discovery was both real and important, and unhesitatingly testified that no other method equaled

that *in vacuo*,—by evaporating the milk out of contact with the air. The presentation of this evidence of the usefulness of his discovery was shortly followed by the issue of the patent asked for, on the 19th of Aug., 1856, more than three years after his first application, its date varying not widely from the sealing of his English patent.*

The grant of the patent changed the field of Mr. Borden's struggles, but did not lessen them. Next in order came the development of the invention into working for commercial results.

For trivial aid rendered to him during his long siege at the Patent office, he had parted with three-eighths of his interest in the patent; and now, for the promise of the venture of means to erect works on a moderate scale, he was led to part with two-eighths more, leaving him little more than one-third. In this, too, he was destined to disappointment, as supplies were stopped when less than two thousand dollars had been advanced for that purpose.

Without relating in detail the embarrassments which attended him at every stage, suffice it to say, that, at length, Borden's Condensed Milk was put

* His English patent was taken out in the name of Isaac Westthorp,—dated Feb. 28th, sealed August 26th, 1856.

upon the market in a small way. Its early progress was very slow. A demand for it had to be created, and this was hindered by the prejudice which had arisen, naturally enough, in the minds of many against any condensed milk, due to the unsatisfac-ory quality of such as had previously been offered for sale.

The first attempt to establish works was at Wolcottville, Litchfield county, Conn., in the summer of 1856. But, disappointed in not obtaining means, nothing was there accomplished. A second attempt was made at Burrville, five miles distant, in 1857, by a company consisting of the owners of the patent,—Mr. Borden holding three-eighths. A small quantity of milk was here successfully condensed, and its introduction into New York began. Although admit ted by all to be superior to any before made, it was slow in meeting with sales proportioned in magnitude to the expenses incurred. Yielding to the monetary revulsion of that year, the company suspended operations, leaving Mr. Borden liable for bills drawn on which he was sued.

It was not until February, 1858, when Mr. Borden (with the other owners of the patent) associated himself with Jeremiah Milbank, Esq., who advanced

money to revive the business, that he could be said to enjoy adequate means to develop his invention; at which time the "New York Condensed Milk Company" was formed, and this, for reasons above indicated, progressed for a while very slowly. Abandoning Burrville, the new company established works on a more extensive scale in a desirable locality at Wassaic, Duchess county, New York, 84 miles from the city of New York, on the Harlem railroad, in 1860, soon after which the civil war caused the product to become quickly and extensively known, so that the demand rapidly increased, until it exceeded the supply. The establishment at Wassaic was, in consequence, repeatedly enlarged, and others erected. The "Borden Condensed Milk Company" has very large works at Brewster's station, also on the Harlem railroad, 54 miles from New York. One of the pans at this place is of unusual capacity, its average rate of condensing being two thousand quarts an hour. In 1865, extensive works were erected at Elgin, 42 miles from Chicago, Illinois. Of all these Mr. Borden now owns one-half. Other companies have been organized from time to time, to work under Borden's patent, but the product known to the trade as the "Gail Borden Eagle

Brand," made at the three above-named places, greatly exceeds in amount all made by the others.

With reference to the practical adoption of the vacuum process abroad, and the alleged indebtedness of the public "primarily to a Frenchman, though mainly to an Englishman," for the only successful process of concentrating milk, it is a significant fact that the first establishment in Europe upon this plan, so far as known, was that of the Anglo-Swiss Company, in the Canton of Zug, erected in 1866, which was engineered by Mr. G. H. Page, formerly of the Patent Office, who prepared himself for the undertaking by critical, personal inspection of Mr. Borden's actual working at several of his establishments, and, to avoid mistakes, secured the services of the coppersmith who (with few exceptions) had done all of Mr. Borden's work of this sort for years past,* thus availing himself at a grasp of the results of Mr. Borden's long experience relative to the details of the arrangements of jackets, coils, pipes and valves in connection with the pan, which had been found best adapted to this work, and upon which the practical

* The earliest letter of Mr. Borden's, relative thereto, found on file, bears date Feb., 1853, its object being to urge the speedy completion of a vacuum pan, for which an order had been previously given.

success of the process greatly depended; and this apparatus he carried to Europe. The Anglo-Swiss Co. was followed, some years later, by others in England and Ireland.

The European establishments for condensing milk erected within five or six years are not only faithful copies of Mr. Borden's works in the matter of apparatus and arrangements, but the rules and regulations designed to secure faithfulness in the operatives, and best quality in the milk furnished, such as *extreme* cleanliness, such cleanliness as has sometimes been characterized by visitors as an "absurdly fastidious neatness," cooling, or, more properly, curing the milk immediately upon being drawn, the character of the food (when not grass only), etc., also manifest the same close resemblance.

Although more widely known in connection with milk, Mr. Borden's labors have by no means been confined to this object, but have extended far into related fields. Passing by, with briefest mention, pemmican, such as he made for use upon Dr. Kane's Polar expeditions, together with the elegant preparations of tea, coffee, and cocoa, by means of which, with hot water, a cup of the favorite beverage possessing the highest aroma can be prepared at a

minute's notice, and also condensed fruit juices, made by first separating the rind, seeds, and pulp, and abstracting water from the remainder, leaving with unimpaired flavor and in a highly concentrated and permanent form all which constitutes the peculiar value of any fruit, we come to other products which deserve more extended notice.

During the very period while Justus Von Liebig, surrounded with the elaborate apparatus of his well-appointed laboratory at Geissen, was prosecuting those researches into the nature of flesh and of animal juices, which culminated many years later in the production, on a commercial scale, of "Extractum Carnis," Gail Borden, in the wilds of Texas, was independently investigating the same problem, by methods intensely practical, and aided only by such apparatus as could there be born of the "mother of invention." Borden's "Meat Biscuit," then and there perfected, described in brief terms, was Liebig's *Extractum Carnis, combined with bread.* It was nothing more, and nothing less.

Shown at the first World's Exhibition at London, in 1851, it won the highest award made in any case, namely, the Great Council Medal. Professor Lyon Playfair and Dr. Edward Solly, after full investigation,

gave it their unqualified approval; and it was the occasion of Mr. Borden's election as an honorary member of the London Society of Arts, in 1852.

At the very time when Liebig, abandoning all expectation that extract of flesh might become an article of commerce, as a matter of conscience thought of recommending to governments its employment in extreme cases,* Borden's Meat Biscuit was being used as the daily food of travelers over the great plains of Mexico. Being both bread and meat, the Meat Biscuit was better for the end then sought than would have been the concentrated juices of meat alone. At a later period, namely, from 1861 to 1865, when our soldiers needed meat juices separate from bread, Mr. Borden, at considerable personal sacrifice, undertook to supply the want. Practical

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* "From 32 pounds of lean beef, free from bones and fat, there is obtained one pound of true extract of flesh, which, from its necessarily high price, can hardly become an article of commerce; but if the experience of military surgeons agrees with that of Parmentier, according to whom, 'the dried extract of flesh, as an article of provision in the train of a body of troops, supplies to severely wounded soldiers a restorative, or roborant, which, with a little wine, immediately revives their strength exhausted by great loss of blood, and enables them to bear transport to the nearest hospitals,' it appears to me a matter of conscience to recommend to the attention of governments the proposal of Parmentier and of Proust."—*Liebig's Researches on the Chemistry of Food.*

difficulties hindered approach to the high standard of excellence which he had proposed for himself, different from those attending the desiccation of the juices in meat biscuit; difficulties which have been uniformly yielded to in the manufacture of Extractum Carnis. But, after protracted efforts, he surmounted them fully, and succeeded in not only reducing meat juices to the smallest bulk, but also in retaining their rich flavor, with no taint of the bitter or burnt taste characterizing all other similar products.

Since perfecting its manufacture, Borden's Extract of Beef has received the unqualified approbation of competent judges, both in the United States and in Europe, as "immeasurably superior in strength and flavor to any and all the other preparations" sold under the name, and with the guarantee of Baron Liebig. But by reason of the expense attending its manufacture from costly beef, and the consequent lack of pecuniary inducement to those concerned in its introtion to general use, its merits have been partially eclipsed by the efforts of parties engaged in the profitable sale of products made in South America from meat of merely nominal cost. This last hindrance to its wide appreciation and use, however,

promises soon to give way; Mr. Borden having arrangements now well in progress for its extensive manufacture in Texas, from meat combining superior quality with very moderate cost. To these he has given much labor, as well as money, and is bestowing personal superintendence.

In person, Mr. Borden is tall and spare. The frontispiece gives a fair presentation of his face—but as it is rarely seen—when at rest; for his temperament being nervous and his enthusiasm unbounded, the countenance in conversation immediately lightens up with animation and varied expression beyond the skill of the artist to fix. His mental powers are unimpaired, his thoughts actively pervading his chosen field of labor, the preservation of food by practical methods. His powers of observation are keen, critical and appreciative; his faculty for devising and adapting means to ends remarkable; his habits active beyond those of most persons in the noontide of life. The snows of seventy winters have silvered and thinned his locks, forming "a crown of glory," according to Solomon, being "found in the way of righteousness;" but their weight rests not heavily upon his shoulders.

His varied career has furnished him with great store of illustrative anecdote and reminiscence ready at call, and freely used.

His religion is eminently of the *life*, manifesting itself less in professions than some, but abundantly in kindness and courtesy to all, and in active philanthropy and hearty co-operation with hand and purse in every good work.

An earnest, unselfish, Christian gentleman, long may he be spared to bless his fellow men.

APPENDIX.

A. (Page 10.)

A denial, such as is referred to, finds place in the (London) "Evening Standard" of Nov. 25, 1871. It occurs in an article on "PRESERVED MILK," occupying several columns, and which, in the main, is worthy of high commendation for the fullness, accuracy and method of its statements. We quote as follows:

"We believe that the credit of first condensing, or rather concentrating milk, is due to a Frenchman, named De Lignac, about twenty-four years ago, from whom the process was obtained soon afterwards by Mr. E. D. Moore, a medical man attached to the Court, who had manufactories in Staffordshire and Middlesex, making concentrated milk, and also a combination of it with cocoa. In 1857, Mr. House, now of 76 Minories, on the retirement of Mr. Moore, took up the business, and on an 'improved patent' has continued it ever since. It was from Mr. House, through a Captain Fletcher, that Mr. Gail Borden, of New York, got his idea of preserved or condensed milk; for though Mr. House calls his 'concentrated' milk, we imagine that the process differs little from that of producing 'condensed' milk, the former being obtained by evaporation of the water from the milk in open pans, the latter by evaporation in closed vacuum pans. We mention these facts to show that primarily to a Frenchman, though mainly to an Englishman, the credit of first producing concentrated or condensed milk is due, and not to Mr. Borden, or any other Americans who may have perfected the process and developed the

" trade, and seem inclined to take credit for the origination of the " whole matter."

The above quotation presents a marked contrast to the general tenor of the article of which it forms a portion. Its force lies chiefly in illustrating the chronic inability of some of our transatlantic cousins to apprehend that *any good thing can originate* seventy degrees west longitude from Greenwich.

We may remark in the first place regarding it, that the "Standard" falls into the same pit where our Patent Commissioners floundered years ago (see pages 14, 15), namely, in recognizing little if any difference between the results of evaporating milk in open pans, as practiced by Mr. House, and evaporation *in vacuo*, to the credit of which Mr. Borden is fairly entitled, he being the first to bring the latter process to practical results. By this method alone has condensed or concentrated milk become an article of general commerce. Made in any other way it was at disproportionate cost and of inferior quality, so as to be used only where fluid milk could not be obtained. If there is little or no difference in the results of the two processes, how comes it that no plain condensed milk (*i. e.* without sugar) has ever been anywhere made by the open pan process, while there are several large manufactories now daily supplying scores of thousands of people with condensed milk containing no sugar nor any addition whatever?

Again, the " Standard " is in error in saying that " Mr. Gail Bor- " den, of New York, got his idea of preserved or condensed " milk " from Mr. House, through Captain Fletcher. Not to dwell " upon the absurdity of the supposition that Mr. Borden " got his " idea"—*the idea of exclusion from atmospheric action during evaporation*—from one who practised only the open air method, *and that accompanied with agitation*, (not substantially unlike, we may suppose, except in lack of agitation, to that which suggested itself

to some worthy housewife of a remote age, who left milk in a dish near the fire longer than usual, and found on her return a dry or pasty residue which *kept* better than milk not so desiccated), it may suffice to compare dates, by which it will be seen that Mr. Borden exhibited condensed milk made by evaporation *in vacuo*, several years before Mr. House was ever heard of in connection with milk.

According to the "Standard," Mr. House "took up the business" in 1857, and conducted it on an "improved patent." The record also shows that Joseph House got his patent in 1857, for concentrating milk by an open air process, with agitation, at a temperature of 140° to 150° Fahr., the product to be put in tins, sealed, and again heated.

Mr. Borden's patent was granted in 1856, both in England and in America, a year before Mr. House appears. Thus Mr. Borden clearly takes precedence. But the distance between them is really greater than appears at first glance; for it should be known that Mr. Borden's process was perfected and practised in a small way before he applied for a patent, which was, in the United States, in May, 1853, three years and four months before it was granted.

Satisfactory evidence that he exhibited condensed milk at an early date, which was made by the vacuum process, and which possessed rare merit, can be gathered from the current literature of that period.

In the "Scientific American" (New York), issue of Nov. 4, 1854, in an article about a method of preserving milk in iron bottles, by Abbe Moigno of Paris, the editor says:

"The plan of Gail Borden, jr., of Texas (inventor of Meat "Biscuit), for preserving milk, we consider far superior to this. It "consists in evaporating the water in the milk in a pan excluded

"from the atmosphere. . . . By this method pure milk can be ob-
"tained, which can be carried about in small bulk, from one end of
"the world to the other."

In a subsequent issue of the same periodical, dated August, 1855, after discussing "solidified milk" made by M. Fadenike, London, and the "Lactine," or artificial milk of Mr. Piesse, the editor says: "The most successful experimenter is Gail Borden,
"jr., inventor of the Meat Biscuit, whose prepared milk we have
"used months after it was made, and found it to be as sweet as on
"the day when it was prepared."

In the (New York) "Daily Journal of Commerce" of August 29, 1857, there appeared an article, written by the editor, David M. Stone, Esq., who was using Borden's Condensed Milk in his family at the time, and has used it ever since, to the exclusion of ordinary fluid milk, from which we quote as below.

"FRESH MILK.

"The name of Gail Borden, jr., has become historical. Notwith-
"standing the youthful suffix to his patronymic, Mr. Borden has
"been before the public for many years, and always in the same
"character.*

"Like other great inventors, he has not always realized pecuniary
"success, but his methods of preserving human food have never
"failed when fairly adopted, and he has long been regarded as a
"public benefactor. Three or four years ago, Mr. Borden showed
"us condensed milk which he had prepared, to be used in long
"voyages, and he was then sanguine of developing his discovery,
"so as to supply families in the city with pure country milk. We
"had missed him from the city for some time, but it seems he has

* As Mr. Borden's father lived to a great age, the son retained the suffix until well advanced in life,—past sixty years.

"not been idle, and we now have the pleasure of chronicling his "return, as enthusiastic as ever, and completely successful. Mr. "Borden's process is exceedingly simple, and ought to be univer- "sally popular, for it is exactly the reverse of the system adopted "by the milkmen, of which there is so much reasonable complaint. ". . . It is simply to evaporate three-fourths of the water, leaving "all the useful properties of the milk remaining. . . . This is "done in a vacuum over a slight heat. . . . The advantages are "obvious . . . Mr. Borden has established a condenser (capable of "reducing 5,000 quarts per day) in Litchfield county, one of the "richest grazing districts in Connecticut. . . .

"The reader will perceive that is *not manufactured* milk, there "being nothing added to it, and nothing taken from it except the "water. . . . The samples we have seen are unexceptionable in "quality and taste, and we regard the experiment as eminently "successful."

The "Milk Journal" (London), January, 1872, shows a fuller apprehension of the facts than does the "London Standard," although not quite out of the fog.

"Some will have it that M. De Lignac was first in the field, and "that his mantle, which fell on Dr. Moore, is still worn by Mr. "House, who succeeded to the last-named gentleman's business, "and that it was from Mr. House that Mr. Borden, the American, "derived his information as to how to treat milk in this way. But "we find Mr. Borden's English patent takes precedence of that of "Mr. House; and we are obliged to confess ourselves not at all "removed from the regions of fogginess in the matter; especially "as we discover that the condensing *in vacuo* is to be met with in "the archives of the Patent Office, in connection with Mr. Grim- "wade's name, as far back as 1847. After this, '*Nil propriam* "*duces quoad mutaria potest*' should be a motto for future milk "preservers."

(B.)

NOTES ON PATENTS.

Among English patents the principal ones and their dates appear to be

Newton, 1835. For evaporating "in any known mode," alludes to the vacuum pan as affording a good method of *introducing* warm air through the milk!

De Lignac, 1847. Evaporating in large, flat, shallow pans, heated by steam bath to 186° F.; product put in tins, sealed, and again heated to 210° F.

Grimwade, 1847. Preserving milk by "the mixing of saltpetre "with the milk, and then exposing it to heat in vacuo, so as to "evaporate and extract the aqueous particles thereof," and then enclosing "in bottles from which the air has been previously ex-"hausted." Never put in practice.

Louis, 1848. Evaporating in shallow pans, with steam jackets, etc.

Grimwade, 1855. Carbonate of soda or potash is first added and the milk then evaporated in pans with agitation until a dough-like substance is obtained; sugar is then added, and the mass pressed by rollers into ribbons, further dried, and then pulverized. Practiced for some years.

Cooke, 1855. Evaporating in steam evaporating pan.

Borden, 1856. *In vacuo*, put into successful practice, and has superseded all others.

House, 1857. Substantially like De Lignac's, except evaporating at lower temperature.

The first condensed milk made in America, so far as known, was by Alden & Co., about 1852, under a caveat; sugar was added, and the product was as good as any by open evaporation.

Blatchford & Co. a little later prepared some in Duchess county; also Mr. Provost, in Orange county, and some others. As the superiority of Borden's process came to be known, other manufacturers adopted it, or abandoned the business.

Among the curiosities of Patent Records and proceedings, may be mentioned the process of one Birdseye, which consisted in placing milk in a vessel with cover and pipe attached "to convey "the steam and flavor arising from the evaporation of milk through "another vessel containing sugar, thereby preserving the pure "flavor of the milk."

"What I claim by my invention, and desire to secure by patent, "is the process described herein of *distilling milk and condensing* "*the same in sugar* (*!!!*) for the purpose of preserving the flavor as "set forth."

To refuse Borden a patent for a new and highly useful process, while granting one for a scheme the folly and absurdity of which can hardly be paralleled, seems quite equal to "straining at a gnat "and swallowing a camel."